Name:_____

NASA Tropical Rainfall Measuring Mission (TRMM)

TOPIC #1: TRMM: Why Measure Rainfall from Space?

Activity #2: The Role of Latent Heat in the Water Cycle

National Science Content Standards A,B,D,E,F & G

OBJECTIVE: To measure the absorption of latent heat during evaporation.

BACKGROUND: When water evaporates and later falls to the Earth as precipitation such as rain it is called the "water cycle". During this process heat from the Sun is transferred from the oceans to the atmosphere. When water molecules in the ocean absorb heat energy from the Sun, they begin to move faster. If enough heat is added the motion is great enough for the water molecules to break their attraction for each other and leave the surface of the liquid to become a gas called water vapor. This process is called "evaporation". The energy stored in these water vapor molecules is called "latent heat". As the warm water vapor rises higher in the atmosphere, it begins to cool. Eventually the water vapor may cool to the point at which it condenses to form clouds and rain. When the water vapor condenses, the "latent heat" is released into the atmosphere. The Tropical Rainfall Measuring Mission (TRMM) satellite instrument is designed to measure rainfall in an effort to indirectly monitor the amount of heat which is being released into the atmosphere. Rainfall data and information about the latent heat that is released will help scientists understand how this added heats affects weather and climate.

Evidence of the transfer of "latent heat" can be observed during the evaporation of water. As water molecules evaporate they absorb heat from their surroundings. You experience the cooling effect of the evaporation of perspiration from your skin when you sit in front of a fan. The increased airflow provides greater opportunities for the water molecules to move from your skin to the passing air currents. As the water evaporates from your skin, it removes heat and therefore creates a sensation of cooling.

HYPOTHESIS: If wet gauze is wrapped around the bulb of a thermometer and it is exposed to gentle air currents, then the temperature will _____.

MATERIALS: Two Celsius thermometers, a small piece of gauze, water, a large index card, a small rubber band and a book

PROCEDURE:

1. Wrap the piece of gauze around the bulb of one thermometer and secure it with a rubber band. Wet the gauze.
2. Lay both thermometers side by side with the bulbs over hanging the edge of a book. The dry thermometer without the wet gauze is the "control" which will later be used for the purpose of comparison.
3. Complete the hypothesis above stating what you expect to happen to the temperature of the wet bulb thermometer when you create a gentle breeze with the index card.
4. Record the starting temperatures of both thermometers
5. Fan the bulbs of both thermometers for 5 minutes.
6. Record the final temperatures.
7. Subtract the final temperature from the starting temperature to determine the amount of temperature change. Record these calculations under " Amount of Change"

DATA:

Temperature (C)	Wet Bulb	Dry Bulb (Control)
Starting Temperature		
Ending Temperature		
Amount of Change		

SUMMARY QUESTIONS:

1. Which thermometer experienced the greatest amount of temperature change?

2. If the temperature dropped, where did the heat go?

3. What is “latent heat”?

4. When is the “latent heat” of evaporation released to the atmosphere?

5. What else do scientists “indirectly monitor” when they record the amount of rainfall?

6. Why are scientists interested in monitoring the amount of released latent heat?

7. Print the letter in the box of the diagram that illustrates the process described.
   A. The Sun warms the oceans
   B. Warm water evaporates and stores latent heat
   C. Water vapor rises, cools, condenses into a cloud and releases latent heat
   D. Precipitation (rain) falls to Earth